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I. Variable — A variable as defined by Webster is a quantity that may assume a succession of values, which need not be distinct. Here we are interested in the numbers which must be used to specify the quantitative measures of any of the characteristics of matter. As the characteristics may take on different values for different individuals in a universe or for the same individual under different circumstances so may their measures.

A. Two types of variables to consider in statistics.

1. Continuous variable can manifest every conceivable value within the range of possible variation. It can take on infinitely small variations, e.g., similar to the length of a continuous line.

2. Discrete (or discontinuous) variable cannot manifest every conceivable value within the range of possible variation, but can vary only by finite steps, e.g., similar to a series of disconnected points. The only such series of interest to us here is the series of positive integers which is used in counting. It must be noted here that there is in practice a region where and beyond which, either for convenience or as a matter of practical necessity, the discrete variable may be and ordinarily is treated as if it were continuous. This is the region where the discreteness is so small relative to the entire range of variation as to become insignificant. That is to say where the practical method actually used to measure a naturally discrete variable gives only an approximate quantity.

B. Whether a variable is continuous or discrete is inherent in the nature of the universe, the characteristic being considered, and the method of determining its value.

1. The size of the variable is ascertained in a continuous variable by a process of measurement and in a discrete variable by a process of counting.

2. The value of a continuous variable is always an approximation while the value of a discrete variable may be determined exactly.

II. Significant Digits

A. A digit in a number is significant if the error in the next digit to the right does not exceed $\pm \frac{1}{2}$ (except in the case of 0's which have been entered before a number just to locate the decimal point).

1. The problem of determining the significance of a digit is different for continuous and discrete variables since one is always an approximation while the other may be exact.

a. An item derived from a discrete characteristic has an infinite number of significant digits if, and only if, it results from an accurate count.

b. An item derived from a continuous always has a finite number of significant digits since it is an approximation resulting from a measurement. The number of significant digits in such a number will depend on the nature of characteristic being measured and the accuracy of the measurement process.

2. Number of significant digits vs. number of significant decimal places.

a. The number of significant digits in a number is determined simply by counting. E.g., the number 123.45 has five significant digits if the true value represented by this number does in fact fall between 123.445 and 123.455.

b. The number of significant decimal places in a number is determined by counting the number of digits to the right of the decimal point (positive). Care must be taken to include zeros on the right of the decimal point which have been written simply to locate the decimal point. If there are no digits to the right of the decimal point and zeros have been entered immediately to the left to locate the decimal point, the number has a negative number of significant decimal places equal to the number of such zeros. E.g., the number 12300. (only three significant digits) has -2 significant decimal places.

c. Examples:

Number	Number Sign. Digits	Number Sign. Decimals
123.	3 (∞)	0 (∞)
123.00	5	2
12300	3, or 4, or 5, (∞)	-2, or -1, 0 (∞)
.123	3	3
.00123	3	5
.12300	5	5

Note: (∞) If an accurate discrete number.
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4. Rules for Computation

a. Addition and subtraction

Retain in the final answer no more significant decimal places than in the item with least number of significant decimal places.

b. Multiplication, division, square root and squaring

Retain in the final answer no more significant digits than in the item with the least number of significant digits.

c. In all steps up to, but not including, the final answer carry two more significant digits or decimal places than in the final answer, then round.

d. Rounding Rules

1. If left-most digit to be discarded is less than 5, the right-most significant digit is not changed.

2. If left-most digit to be discarded is more than 5, the right-most significant digit is increased by 1.

3. If left-most digit to be discarded is exactly 5, the right-most significant digit is increased by 1, if it is odd or is not changed if it is even.

e. Examples

[illegible] ; [illegible] ; [illegible] (4 significant digits) ; [illegible] ([illegible] significant digits) ; [illegible]

129.3
x 34.6
4470. (3 signif digits)

[illegible]
x [illegible] (exact number)
[illegible]

123.4
x .003
.4

123.4
x 3 (exact number)
370.2

34.6 ÷ 129.3 = 0.268 (0.26759 which is properly rounded to 0.268)